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IN THE

Supreme Court of the United States

OCTOBER TERM 1982

METROPOLITAN EDISON COMPANY, JERSEY CENTRAL POWER & LIGHT COMPANY AND PENNSYLVANIA ELECTRIC COMPANY,
Petitioners,

v.

PEOPLE AGAINST NUCLEAR ENERGY, *et al.*,
Respondents.

UNITED STATES NUCLEAR REGULATORY COMMISSION AND THE UNITED STATES OF AMERICA,
Petitioners,

v.

PEOPLE AGAINST NUCLEAR ENERGY, *et al.*,
Respondents.

On Writs of Certiorari to The United States Court of Appeals for The District of Columbia Circuit

BRIEF FOR THE UNION OF CONCERNED SCIENTISTS AS *AMICUS CURIAE* IN SUPPORT OF RESPONDENTS

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QUESTION PRESENTED

Whether the National Environmental Policy Act of 1969 requires the Nuclear Regulatory Commission to consider the impact of reopening Three Mile Island Unit No. 1 on the psychological health of surrounding residents where (1) the impact is alleged to involve medically recognized damage to human psychological health in an area where such damage has already occurred as a result of the accident at Three Mile Island Unit No.2, (2) the health damage would be directly caused by the alteration of the human environment of the area by the restart of Unit 1, and (3) the health damage is directly related to the potential for physical harm from a nuclear accident should the restart Unit No. 1 be allowed?

TABLE OF CONTENTS

	Page
QUESTIONS PRESENTED	i
TABLE OF CONTENTS	iii
TABLE OF AUTHORITIES	iv
PRELIMINARY STATEMENT	1
INTEREST OF *AMICUS CURIAE*	2
SUMMARY OF ARGUMENT	3
ARGUMENT	6
THE EVENTS OF MARCH 28-30 POSED A SERIOUS THREAT TO THE HEALTH AND SAFETY OF THE PEOPLE SURROUNDING THREE MILE ISLAND	6
CONCLUSION	13

TABLE OF AUTHORITIES

	Pages
CASES:	
First National Bank of Chicago v. *Richardson*, 484 F.2d 1369 (7th Cir. 1973)	5
Hanley v. *Kleindienst*, 471 F.2d 823 (2d Cir. 1972)	5
Metropolitan Edison Co. (Three Mile Island Nuclear Station, Unit No. 1), ALAB-705 (Dec. 13, 1982)	6
STATUTES:	
National Environmental Policy Act of 1969, 42 U.S.C. 4321 *et seq.*	5
MISCELLANEOUS:	
Benjamin, *Nuclear Study Raises Estimates of Accident Tolls*, Washington Post, Nov. 1, 1982 at A1.	4
D. Ford, *Three Mile Island, Thirty Minutes to Meltdown* (Penguin Books 1982)	13
Nuclear Power Plant Accident Considerations Under the National Environmental Policy Act of 1969, 45 Fed. Reg. 40,101 (June 13, 1980)	6,13
Overview of the Reactor Safety Consequence Model, NUREG-0340 (1977)	4
Proposed Annex to 10 CFR Part 50, Appendix D, 36 Fed. Reg. 22,851 (1971)	6
Reactor Safety Study: An Assessment of Accident Risks in U.S. Commercial Nuclear Power Plants, WASH-1400 (Oct. 1975)	4
Report of the President's Commission on the Accident at Three Mile Island—The Need for Change: The Legacy of TMI (Oct. 1979)	3,6,9,12
Staff Reports to the President's Commission on the Accident at Three Mile Island, Reports of the Technical Assessment Task Force, Vol. II (Oct. 1979)	11
Three Mile Island, A Report to the Commissioners and the Public, Nuclear Regulatory Commission Special Inquiry Group (Jan. 1980)	*passim*

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PRELIMINARY STATEMENT

The Union of Concerned Scientists has received the consent of the parties to appear as *amicus curiae* in this proceeding in support of the position of Respondents, People Against Nuclear Energy. Letters confirming consent have been filed with the Court.

INTEREST OF *AMICUS CURIAE*

The Union of Concerned Scientists (UCS) began in 1969 as a group composed primarily of faculty members in science and engineering disciplines at the Massachusetts Institute of Technology. UCS has become a national organization supported by the contributions of some 100,000 citizens, with professional staff in Cambridge, Massachusetts and Washington, D.C. UCS's work includes educational activities, participation in adjudicatory and rulemaking proceedings, legislative representation and litigation, all of which are supported by independent technical research and analysis conducted by UCS's staff and outside professional advisors. The issues of primary concern to UCS are energy policy, nuclear safety and arms control. UCS's goals are the adoption of a safe and sensible course for America's energy program and a world secure from the threat of nuclear war.

The Union of Concerned Scientists has a record of achievement. Its participation in ground-breaking Atomic Energy Commission proceedings on emergency core cooling systems in 1971-72 led to the first serious public examination of nuclear power plant safety.

In 1980, following up on the lessons learned from the fire at the Browns Ferry Nuclear Plant, UCS legal and technical work culminated in the adoption by NRC of industry-wide standards for the protection of nuclear plants from threats posed by fire and other accidents. UCS has participated in a variety of other AEC and NRC proceedings, including the ongoing proceedings to determine whether and under what conditions Three Mile Island Unit I should be permitted to operate.

UCS has published many technical books and studies covering topics such as U.S. energy options, radioactive waste management, techniques for verification of arms control agreements and analyses of alternative national security policies.

The Chairman of the UCS Board of Directors is Dr. Henry W. Kendall, professor of physics, Massachusetts Institute of Technology. Serving with him on the Board are Dr. James Fay,

MIT professor of mechanical engineering; Dr. Kurt Gottfried, Cornell University professor of physics; Leonard Meeker, Esq., former Legal Advisor, U.S. Department of State and former U.S. Ambassador to Romania; Dr. Herbert Scoville, Jr., former Deputy Director of the Central Intelligence Agency and currently President, Arms Control Association; and Richard Wright, executive vice-president, Chronar Corporation and formerly Congressional Liaison, U.S. Department of Energy.

In the case before the Court, the Union of Concerned Scientists seeks to present facts showing that, contrary to the assertions of the Petitioners, the accident at Three Mile Island Unit 2 posed a grave risk to the health and safety of the surrounding population. We do so out of the conviction that denial of the nature and magnitude of that risk increases the chance that it will be repeated and in the knowledge that, without perseverance and dedication to improvement, the consequences on the next occasion could be far worse.

SUMMARY OF ARGUMENT

Most of the briefs of the Petitioners and *amici* in their support before this Court present the argument, either explicitly or through the calculated and repeated use of words such as "fears" and "groundless fears," (Brief for Petitioners Metropolitan Edison Company *et al.* at 4) that the accident at Three Mile Island, Unit 2 ("TMI-2") posed little or no real threat to the people surrounding that plant. Petitioner Metropolitan Edison *et al.* asserts that "it is fair to say that there was no actual danger to the public and that the mental stress was caused primarily by confusion and misinterpretation." *Id.* It is the intention of the Union of Concerned Scientists to show that this *post hoc* characterization of the events of March 28-30, 1979, is grossly misleading. During the first day of the accident, a remarkable series of equipment failures, design errors and human blunders led to uncovery of the reactor core and total blockage of coolant for prolonged periods of time. Both the President's Commission on the Accident at Three Mile Island (the "Kemeny Commission") and the NRC's Special Inquiry Group (the "Rogovin Report") have concluded upon analysis

that TMI-2 was within an hour or less from an irreversible meltdown of the reactor core and, perhaps most significantly, that those in charge of operating the plant did not realize that the core was not being cooled and had, therefore, no understanding of the gravity of the danger. Under these circumstances, the risk to the public was palpable; a few more equipment failures or human miscalculations would have led to meltdown. The consequences of such a meltdown are still far from fully understood. If only a fraction of the core's enormous inventory of radioactive material were released, the consequences to the surrounding population could be grave, indeed.[1]

Thus, while we are thankful that a catastrophe was averted, it would be dangerously wrong to conclude that a real risk was never present. Petitioners seek to rewrite history and, in so doing, to trivialize the nature of the threat and the stress suffered by those who were and remain at risk. The Court of Appeals was correct in recognizing the "holocaust potential of an errant nuclear reactor." (Pet. App. 15a)

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[1] A number of analyses of the frequency and magnitude of potential consequences of reactor accidents have been done under NRC auspices. NRC uses for this purpose a computer code denoted as "CRAC" (Calculation of Reactor Accident Consequences). The most comprehensive analysis to date is contained in the *Reactor Safety Study: An Assessment of Accident Risks in U.S. Commercial Nuclear Power Plants*, WASH-1400 (October 1975). For a typical reactor, a release under adverse conditions involving 20-30% of the core inventory of iodine and particulates is calculated to result in 300 early deaths, 18,750 latent cancer deaths, and $10 billion in property damage. These figures are derived from *Overview of the Reactor Safety Consequences Model*, NUREG-0340 (June 1977) Table 10 at 38. The accident is denoted as "PWR-3" Note that the figures in that table for latent fatalities are reported on a per-year basis and must be multiplied to produce totals.

This accident is of very low probability but is by no means the worst case. Recent work done at Sandia National Laboratories under contract to NRC projects worst case consequences for an accident at TMI-1 of over 40,000 early deaths. Benjamin, *Nuclear Study Raises Estimates of Accident Tolls*, Washington Post, Nov. 1, 1982 at A1. Moreover, the WASH-1400 figures understate the consequences of such an accident at TMI, which is a more densely populated site than the hypothetical "typical" site used for the calculation. There are very large uncertainties involved in all such predictions.

Petitioner Metropolitan Edison has cited cases on pages 25-26 of its brief which suggest that the cognizability of effects on human psychological health under the National Environmental Policy Act may depend substantially upon whether the "fears" in question are grounded in reality. In *First National Bank of Chicago* v. *Richardson,* 484 F.2d 1369 (7th Cir. 1973), the Court concluded:

> As regards public "sensibilities" aroused by criminal defendants, we question whether such factors even if amenable to quantification, are properly cognizable *in the absence of clear and convincing evidence that the safety of the neighborhood is in fact jeopardized.*

Id. at 1380 n. 13 (emphasis added); *see also Hanly* v. *Kleindeinst,* 471 F.2d 823, 834 (2d Cir. 1972). If the cognizability of the psychological trauma suffered by the respondents and their neighbors is dependent to a significant degree on whether the risk occasioning this trauma is a genuine one, the respondents in this case should prevail.

Both the Nuclear Regulatory Commission and Metropolitan Edison argue that, to the extent that the trauma is justified, it should be alleviated "by assuring that any factual basis therefor is publicly aired and fully explored. . . ." Brief for the United States and the United States Nuclear Regulatory Commission at 48. *See* also Brief of Metropolitan Edison Company *et al.* at 33: "Insofar as fears and perceptions coincide with reality, the public concern will be satisfied by consideration of the actual impacts. . . ." In the descriptions of the NRC review process[2] which accompany these pronouncements, the Petitioners omit some salient facts: While an Environmental Impact Statement was prepared before TMI-1 was licensed, that statement did not publicly disclose or discuss at all either the

[2] While laden with procedure, the actual safeguards provided by this process were characterized by NRC's Special Inquiry Group as "false assurance[s]" and "a ritualistic process, the result of which is effectively predetermined." Rogovin Report, Vol. II, Part I at 11. The Rogovin Report's recommendations for enhancing effective public participation were never followed by NRC.

probability or the potential consequences of a serious nuclear accident. Under NRC policy, such an accident was simply deemed incredible. Proposed Annex to 10 CFR Part 50, Appendix D, 36 Fed. Reg. 22,851 (1971).

In the wake of the TMI-2 accident, NRC no longer claims that such accidents are incredible and will disclose and consider their probability and consequences in future Environmental Impact Statements. Nuclear Power Plant Accident Considerations Under the National Environmental Policy Act of 1969, 45 Fed. Reg. 40,101 (June 13, 1980). However, it proposes to allow operation of TMI-1 without publicly airing or considering these potential impacts—precisely the impacts which are of concern to the neighbors of TMI—because TMI-1 was licensed to operate before NRC was compelled by the intrusion of reality to change its policy. *Metropolitan Edison Company* (Three Mile Island Nuclear Station, Unit No. 1), ALAB-705 (December 13, 1982). Thus, the full exploration and public airing which is claimed by the government to be available to alleviate the concerns of the public is not completely full. On an issue which is justifiably of the utmost concern to the public, NRC keeps silence.

ARGUMENT

THE EVENTS OF MARCH 28-30 POSED A SERIOUS THREAT TO THE HEALTH AND SAFETY OF THE PEOPLE SURROUNDING THREE MILE ISLAND

In the immediate aftermath of the Three Mile Island accident, a number of investigations were undertaken to determine its causes, to identify with precision the course of the often-confusing events and the extent of the damage to the plant and to recommend changes in the way in which nuclear power plants are designed, constructed, licensed and operated so as to prevent such accidents, or worse, in the future. The two most comprehensive of these investigations are the *Report of the President's Commission on the Accident at Three Mile Island—The Need for Change: The Legacy of TMI* (Oct. 1979) ("Kemeny Commission") and *Three Mile Island, A Report to*

the Commissioners and to the Public, Nuclear Regulatory Special Inquiry Group (Jan. 1980) ("Rogovin Report"). The descriptions of the TMI-2 accident that follow are largely derived from those two sources. They demonstrate that the events of March 28-30, 1979, presented a serious risk to public health because a string of equipment failures, design errors and human blunders brought TMI-2 perilously close to irreversible damage and, while the plant approached the brink, neither the operators nor the NRC understood what was occurring or grasped the gravity of the situation. It is this remarkable and persistent lack of understanding that made TMI-2 such a close brush with disaster.

TMI-2 is a pressurized water reactor. In nuclear plants of this type, the reactor core is cooled by a closed loop of water kept under high pressure to prevent boiling, called the primary coolant system. The interface between this primary system and the "secondary" or "feedwater" loop consists of two so-called "steam generators." These are essentially boilers where water in the feedwater system is heated to steam by contact with tubes carrying the primary coolant. Heat is drawn off in this way from the primary system. Large pumps keep the water in both the primary and feedwater systems circulating. A more detailed description of a pressurized water reactor is contained in the Rogovin Report at 10-12.

The sequence of events on March 28, 1979, began with a clog in the equipment designed to remove impurities from the feedwater system—the "condensate polishers." The operators' inability to remove the clog led to a total loss of main feedwater. The backup system, emergency feedwater, did not deliver water because two valves which should have been open were closed. *Id.* at 7-8, 12-13, 17. Heat was not then being removed from the primary coolant system.[3]

[3] Although the reactor was automatically "tripped," stopping the chain reaction within the core, heat continued to be generated; the radioactive material in the fuel generates "decay heat" long after the chain reaction is stopped. This heat must be removed. Rogovin Report at 12.

The temperature and pressure in the primary system ascended quickly. Pressure reached the set point of a relief valve in the pressurizer,[4] causing that valve to open. Instead of closing automatically as pressure dropped, as it is designed to function, this valve, known as the "pilot operated relief valve" or PORV, stuck open. Primary cooling water rushed out this valve at the rate of 220 gallons per minute for over two hours. *Id.* at 13, 15.

The plant's operators were aware of the "inconstant histories" of such valves. *Id.* at 14. They had therefore installed an indicator light to tell them when the valve was open. The light turned on when electric power was supplied to the PORV and off when the power was shut off. *Id.* There is a fatal flaw in this design that was either overlooked or thought unimportant by those who designed it:

> Unfortunately, the light is proof only that power is reaching the valve-opening mechanism; it is only circumstantial evidence of the actual state of the valve itself, i.e., power has been cut off from the solenoid now, and the light shows it—but the valve remains open. It is ironic, in a day that will be marked by repeated refusal of the operators and supervisors to believe ominous readings from the reactor-monitoring instruments, that they elect to be misled by this bearer of what they perceived to be good tidings. *Id.*

Despite the fact that primary system pressure continued to drop precipitously, the operators failed to understand that they were experiencing a loss-of-coolant-accident. With primary cooling water continually pouring out the PORV and the remaining coolant boiling in the core, the core was gradually exposed and bubbles of steam and noncondensible gas were formed. *Id.* at 16, 23, 28, 47.

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[4] The pressurizer is a tank in the primary system which is used to control primary system pressure. Rogovin Report at 11.

Meanwhile, the failures and errors proliferated. The emergency core cooling system was automatically initiated by a signal derived from low primary system pressure. Almost immediately, it was shut off by the operators who did not understand that they were losing cooling water. *Id.* at 16-17. Only a tiny trickle of cooling water was delivered to the overheating reactor core for the next three hours. *Id.* Shutting off emergency cooling was a key and continuing mistake. It was caused by a combination of complex factors involving the peculiar vulnerability of the Babcock and Wilcox design to vicissitudes in the feedwater system, lack of understanding on the part of the operators of the plant's reaction to this sort of loss-of-coolant-accident, grossly inadequate training and procedures, and the persistent failure of those in charge to believe the bad news being registered by their instruments and numerous other indications that the core was uncovered. *See* Rogovin Report at 16-20, 30, and Kemeny Commission at 93-100. The entire progression of the accident is described in the Rogovin Report at 7-87 and the Kemeny Commission at 90-137.

A great many more failures of human understanding, foresight and equipment followed those briefly described above. Despite the presence on-site within a few hours of numerous NRC personnel and the top technical people from the utility, and despite constant telephone communication with NRC headquarters and Babcock and Wilcox, the crucial fact that the core was uncovered for long periods of time was unknown to the plant operators on March 28. The Rogovin Report describes the pervasive and false sense of assurance as follows:

> In Lynchburg, the B&W task force calls it a day, secure in the thought that everything is all right. At GPUSC headquartered in New Jersey, Bob Arnold's engineers too feel satisfied that they have done a good day's work. They break up and leave for home around 9:00 p.m., already planning a Thursday they feel will be taken up chiefly with organizing an investigation and analysis of the accident.

This, however, is the true situation at TMI-2 on Wednesday night: The core is physically disarranged to such a degree that cooling water flow is impeded and steam pockets still surround some of the fuel. The reactor coolant system contains significant amounts of hydrogen, which also tends to block cooling water flow, as well as posing certain hazards of its own. *In short, the situation is markedly different, and substantially more ominous, than it would be with the core basically intact and the fuel rod cladding perforated only to a limited extent. Should the reactor coolant pumps be lost or system pressure drop again, continued core cooling would be endangered.* And, although it is not yet recognized, there already has been a potent demonstration of what can happen when vented hydrogen collects in the reactor building. [There has been a hydrogen explosion.]

With the failure to understand the continuing risks, there is also a neglect of measures that might be taken to reduce those risks. Procedures could be developed, for example, to drill the operators in the best means of coping with various malfunctions that might still occur. Precautionary action could be taken to avert a decrease in system pressure or a possible hydrogen explosion. Contingency plans need working on for early warning in the event of a possible need for evacuation.

None of this is done. Things are much more stable than they were, but the accident is far from ended. The plant is not fully under control. It is a stark fact that will not be fully appreciated by the management and staff, or by the regulators, until Friday.

In the interim, because critical things that might have gone wrong did not, this lack of appreciation does not affect the ultimate course of the accident, other than to delay recovery action. It does increase the ultimate risk, however, because appropriate contingency planning and mitigating actions are not underway.

> Most important, insensitivity to the continuing danger on the part of key people in the utility and the NRC will affect the public perception of the accident and public confidence in the people in charge of protecting the public's interests. Early reports now indicate all is well—things are under control. Later reports will show that they are not at all.

Rogovin Report at 47 (emphasis added).

Thus, Metropolitan Edison's claim to this court that "there was no actual danger to the public" is untrue. The danger was real; that it was ultimately averted cannot change this fact.

Both the Rogovin Report and the Kemeny Commission performed analyses to determine how close the plant was to irreversible meltdown. As noted above, the emergency core cooling system was shut off by the operators early in the accident. Had this system not been subsequently turned on at three hours and 20 minutes into the accident, the TMI-2 core could have reached melting temperature in less than an hour and, depending upon the assumptions made, in possibly only a few minutes. *Staff Reports to the President's Commission on the Accident at Three Mile Island, Report of the Technical Assessment Task Force,* Vol. II at 118. Another scenario involves the PORV, the valve through which the cooling water escaped. A shift foreman reporting for duty two hours into the accident closed a block valve upsteam of the PORV, terminating the loss of coolant. The Rogovin Report concludes:

> If that block valve had remained open, our projections show that within 30 to 60 minutes a substantial amount of the reactor fuel would have begun to melt down—requiring at least the precautionary evacuation of thousands of people living near the plant, and potentially serious public health and safety consequences for the immediate area.

Rogovin Report at 91.

After the onset of meltdown, the uncertainties in predicting how an accident could unfold increase dramatically. Calculations were performed indicating that the TMI-2 containment could survive. Kemeny Commission at 14. This was not, however, viewed by the analysts as cause for relief:

> Whether in this particular case we came close to a catastrophic accident or not, this accident was too serious. Accidents as serious as TMI should not be allowed to occur in the future.
>
> The accident got sufficiently out of hand so that those attempting to control it were operating somewhat in the dark. . . . *Once an accident reaches this stage, one that goes beyond well-understood principles, and puts those controlling the accident into an experimental mode (this happened during the first day), the uncertainty of whether an accident could result in major releases of radioactivity is too high.*

Id. at 15 (emphasis added).

It is ironic that the supposed hydrogen bubble inside the reactor coolant system which finally precipitated NRC's recommendation for a precautionary evacuation on Friday, March 30, was not a genuine safety hazard. Rogovin Report at 77-83.[5] Petitioners and *amici* focus on this contretemps, claiming that it shows that community "fears" were unfounded. Brief for Petitioners Metropolitan Edison Company *et al.* at 4, 35; Brief for *Amicus Curiae* Scientists and Engineers for Secure Energy, Inc. at 20. The irony is that when the public was genuinely threatened early in the accident, neither Metropolitan Edison nor the NRC was aware of it. As Commissioner Peter Bradford said: "If anybody had told us on Tuesday that the Three Mile

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[5] Hydrogen was created by the reaction of the crumbling and overheated fuel cladding with water. While it was not explosive while contained in the primary system, because of a lack of oxygen to create a combustible mixture, substantial amounts of hydrogen did leak into the containment building where it exploded. Rogovin Report at 42-43.

Island core was going to be uncovered on Wednesday, I can't imagine that we would have failed to order an evacuation."[6] Those who now seek to downplay the risk to public safety during the accident should find no support in the frightening fact that their confusion was so complete that they were unable to distinguish real from unreal danger.

CONCLUSION

The theme running through the NRC's and Metropolitan Edison's presentations to this Court is that the Respondents' perception of the risk to which they were subject in March of 1979 is grossly at variance with reality. That finding is the logical underpinning of the core of the government's position: that it is the "existence" of the plant itself which causes their trauma, "a cause entirely distinct from the radiation or accident potential associated with plant operation," and a cause which is not related to environmental impact. Brief for the United States *et al.* at 29; *see also Id.* at 26, 43. As we have shown above, the conclusions of those who investigated the accident are utterly at odds with Petitioners' belated trivialization of the danger.

The risk of death and injury from the release of radioactive material is an environmental impact causally related to the operation of the Three Mile Island nuclear power plant, not its "existence," as the government would have it. NRC recognizes as much.[7] The probability and consequences of serious accidents are now considered in the Environmental Impact Statements for new nuclear plants, although these have never been considered for TMI-1. Statement of Interim Policy, Nuclear Power Plant Accident Considerations Under the National Environmental Policy Act of 1969, 45 Fed. Reg. 40,101 (June 13, 1980). That risk was never so close to actualization as on

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[6] D. Ford, *Three Mile Island, Thirty Minutes to Meltdown* 175 (Penguin Books 1982).

[7] "Of course, NEPA may require the consideration of events—such as a major nuclear accident—that are quite unlikely to occur but that would entail substantial environmental effects if they occurred." Brief for the United States *et al.* at 45-46.

March 28, 1979. The trauma which resulted and which is said by the Respondents to persist is grounded in reality. However unfortunate that reality, we do not profit from denying it. *Amicus curiae* Union of Concerned Scientists urges the Court to affirm the decision below.

Respectfully submitted,

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